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# Studying the effect of value added tax on the size of current government and construction government

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**Abstract**

The present research studies the effect of value added tax on the size of current government and construction government. Research hypotheses tested by studying the relationship between value added tax and the size of current government (in the form of current cost to gross domestic product (GDP)) and the size of construction government (in the form of construction cost to GDP). In this regard, seasonal time-series statistic within the period of 2008-2014 applied through using ARDL model. Research results show that there is a positive, significant relationship between value added tax and the size of current and construction governments. This tax more influences the size of construction government than the size of current one. Indeed, contrary to developed countries, collecting value added tax mostly influences the ratio of construction expenditures to GDP rather than influencing reduced poverty through increasing welfare expenditure, which increase government current expenditures.



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*Keywords:* Size of current government; size of construction government; value added tax; ARDL model; JEL classification; H11; H20

## 1. Introduction

Government plays a critical role in macro-economy. Government economic activities have social outcomes and objectives, on one hand; and governmental activities influence private sector activities, on the other hand. Government

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requires sources of income to play its various roles and to fund its expenses. Taxes are one of the government earning sources. Taxes in Iran historically provided little share of government revenues. The most common reason may be due to the easily earned oil revenue directing country's economic system to the road in which taxes were on the edges.

Financing government current expenditures by tax revenues has always been interested by national planners and statesmen. Increased nontax revenues and oil revenues in different periods besides inadequate considering of financial discipline in government budget as well as lack of efficient tax system caused taking temporary measures. However, covering government current costs not only requires preventing excessive increasing of government current costs, but also it needs enhancing tax system and increasing tax revenues (Kiyani et al, 2012; 2). Introducing a new tax such as value added tax in the area of increased tax revenues may help in raising tax ratio to government current costs (Samimi et al, 2005; 4).

Value added tax (VAT) is a multistep tax obtained in various steps of importing, production and distribution based on some percent of added value of the sold goods or delivered services in each step. However, settlement in each step of import, production, and distribution chain transferred to the chain next step element so that finally paid by the final consumer (Central Bank balance sheet, 2008).

The present research studies the relationship between value added taxes and the size of current and construction government in Iran's economy. If government size merely measured through absolute cost tools disregarding other factors (such as the size of total economy), then no significant work is done. Since while country's general costs increase, other economic items including personal income, prices, total product and population increase, too. The scientific value of the aforementioned comparison introduced where relative rates of the relation between public costs and other key factors considered. Therefore, to show a much precise size of public sector requires comparing costs with some macroeconomic elements (Dadgar, 2013; 209). The present research used costs to gross domestic production (GDP) ratio to estimate government size. In this regard, two hypotheses proposed: 1. Value added tax increases the ratio of government current expenditures to GDP. 2. Value added tax decreases the ratio of government construction expenditures to GDP. Research hypotheses tested using the size of current and construction government. In this paper, the model is introduced following studying theoretical basics and related works. Research findings are presented in section five. And finally, section seven concludes and proposes further recommendations.

## 2. Theoretical basics

### *2.1. Government size theories*

Some theories of government size were citizen-oriented and some formulated based on the government.

- Citizen-oriented theories: these are based on this that government size grows relying on citizens' demands.

One of the oldest government growth theories is Wagner theory. He analyzed expenditure data of several developed countries and claimed that the public sector share of GDP has an increasing trend. He, firstly, noticed that economic growth requires legal infrastructures. Secondly, developing urbanism also requires increased government costs. Thirdly, public goods have high income attraction. Finally, he concluded that public sector gets larger once real per capita income increased. Though, Wagner theory properly interpreted government growth, it merely relied upon demand dimension such that supply area was ignored.

Government as fair distribution element: according to some theories, government is mainly focused on fairly distributing wealth and income. These theories stated that the majority prefer high tax rate for reach and transfer payment for low income individuals. As middle-income and low-income citizens include the majority of the society, meeting the majority demands requires government growth. Since, higher tax rate, on one hand; and increasing public sector costs, on the other hand, cause reduced gross production and increased government cost ratio to production, which per se indicates government growth. Of the well-known theorists in this area Meltzer and Richard (1983) may be mentioned.

- Government-based theories and other theories of government size: these theories center on government preferences rather than citizens'.

Fiscal illusion theory: according to theory of fiscal illusion, in countries with no transparent and standard tax system and lacking precise ways of funding public services, authorities defraud citizens about government size. Therefore, government is really in big size; while, the officials pretend it small. Thus, this theory in which real government costs are concealed by authorities provides the motivation and opportunity of developing public sector. One way of masking is indirect taxes and renting sources such as crude oil. According to fiscal illusion theory, citizens measure government size through amount of paying tax. Therefore, the less apparent the taxes for citizens, the more probably applied by government. Thus, it is expected that government with maximum increase in public sector dimensions are the governments, which increasingly rely on indirect tax and social insurance contributions. Buchanan (1967) can be regarded as one of the main evolutionists of this theory who formulated the notion of fiscal illusion in the theory of government size.

## 3. Experimental studies

There have been yet no studies on the effect of added value tax on government size; however, some studies conducted on effective factors of government size, which are summarized in Table 1 .

Table 1: Summaries of studies conducted on the size of government

| Researcher(s) | Research objective | Variables and method | Results |
|---|---|---|---|
| Mohammadiyan, F., Amade, H., and Shakeri, A. (2013) | Introducing and testing the new model of explaining government size | Variables of demand, supply, and other variables; presenting a conceptual model and experimental estimation for 103 selected nations. The theories experimentally tested. | Per capita income, inequality, and urbanity ratio of the demand variables has negative, positive, and positive, significant effect on government size, respectively. Of the economy supply variables the indirect taxes positively and significantly influence government size. In other factors (factors other than demand and supply), three variables of population aging ratio , open economy level , as well as women participation rate in labor market positively and significantly influence government size. |
| Dadgar, Y., Nazari, R., and Seyami araghi, I. (2013) | Optimized tax and government in public sector economy and government and tax function in Iran | It studies optimized government and tax by the aid of two factors of consumption expenditures to GDP ratio and tax to GDP ratio in addition to analyzing the government and tax structure. | The size of optimized government based on government expenditures index to GDP is over optimized and tax revenues to GDP are under optimized. Lack of healthy administration in the country is to some extent rooted in government structure. Thus, establishing optimized government is always consistent with optimized tax system. |
| Sang Han and Casey Mulligan (2002) | Studying the relation between inflation and government size | | The government size is positively related to inflation as one of uncertainty factors; it means that the higher the inflation, the larger the government; whereas, regarding nondefense costs during war, there is a weak, negative relationship. |
| Jean Pisani-Ferry and André Sapir (2008) | Government size and uncertainty of production | | They concluded that government costs in Euro region is over 45% of GDP. Whereas, automatic stability may create changes in the composition of cost and income, namely, by increased social security and using direct tax system. However, even this automatic stability may be unable of compromising productivity losses. Finally, an obvious alternative proposed between monetary and fiscal stability of larger governments. As, firstly, higher fiscal development reduces the need to more fiscal stability; secondly, when governments lack alternatives, they may adopt stability friendly policies like USA and Japan, which |

| | |
|---|---|
| | achieved economic stability and sustainment through this way. |

Credit: Researchers' studies

The present research is distinguished from earlier studies conducted in Iran as no studies yet investigated the effect of value added tax on the size of current and construction government. This research studies the relationship between value added tax and the size of current and construction government.

## 4. Research methodology and model specification

### *4.1. Auto Regressive Distributed Lag (ARDL) Method*

This approach has particular merits comparing prior methods:

First, it distinguishes dependent and explanatory variables and solves endogenous problem. Second, it simultaneously estimates short-term and long-term components and removes the issues of deleted and autocorrelation variables. Third, it is of the methods on the contrary to Johansen- Josilius method in which all variables require the same order unity, it is not necessary to similar unity order such that the proper model selected just by determining proper intervals for variables. Fourth, avoiding deficiencies of other models including bias in small samples and inability of statistical test directs us toward better methods for analyzing short- and long-term relations between variables including autocorrelation approach and distributive lags (Abbasi nejad, 2013; 307). In general, a dynamic model is the model in which variables' intervals enter like equation 1.

$$Y_t = aX_t + bX_{t-1} + cY_{t-1} + u_t \quad (1)$$

However, it is better to use a model with many lags for variables such as equation 2 so that reduce biased estimation of model coefficients in small samples.

$$\phi(L,P)Y_t = \sum_{i=1}^{k} b_i(L,q_i)X_{it} + cW_t + u_t \quad (2)$$

Equation 2 is auto regressive distributed lag (ARDL) model as follows:

$$\phi(L,P) = 1 - \phi_1 L - \phi_2 L^2 - \cdots - \phi_p L^p \quad (3)$$

$$b_i(L,q_i) = b_{i0} + b_{i1}L + \cdots + b_{iq}L^q., i = 1,2,\ldots K \quad (4)$$

Where, L is lag operator, W is a vector of constant variables such as intercept, virtual variables, time trend, and or exogenous variables with constant lag. Microfete estimated the equation for all modes and all possible orders i.e. (m+1) k+1 times. M is the maximum lag determined by the researcher and k is the number of explanatory variables. In next step, one of the equations selected using one of the Akaike, Schwarz Bayesian (SBC), Hannan-Quinn (HQC) or R-Bar Squared criteria. Generally, Schwarz Bayesian (SBC) criterion is used in samples lower than 100 not to lose large numbers of degree of freedoms.

Model long-term coefficients computed using the same dynamic model. Long-term coefficients related to X variables obtained by equation 5.

$$\theta_i = \frac{\hat{b}_i(l,q_i)}{1-\hat{\phi}(l,p)} = \frac{\hat{b}_{i0}+\hat{b}_{i1}+\ldots+\hat{b}_{i1}}{1-\hat{\phi}_1-\ldots-\hat{\phi}_p}\ ,\ i=1,2,\ldots K \quad (5)$$

*4.2. Model specification*

This research used the two following models to study the effect of value added tax on government size. Research first hypothesis is tested by equation 6.

$$LCG = f(LVAT) \tag{6}$$

Research second hypothesis is tested by equation7.

$$LDG = f(LVAT) \tag{7}$$

LCG= log of current expenditures to GDP ratio

LDG= log of construction expenditures to GDP ratio

LVAT= log of value added tax

All data used in this research were seasonal within June 2008- April 2014 collected from central bank statistics.

## 5. Research findings

*5.1. Testing variables' reliability*

Modeling time series assumed based on variables' reliability. A variable is reliable when mean, variance, and autocorrelation coefficients are constant over time (Suri, 2011; 222). Reliability of the variables verified using augmented Dicky-Fuller (ADF) and Philips- Perron tests.

Table 2.Results of variables' unit root test

| Variable | Number of differentiations | Optimized lag | ADF-based test statistics | PP-based test statistics | Critical area statistics at 95% | Durability |
|---|---|---|---|---|---|---|
| LCG | 0 | 1 | -5.229553 | -5.260053 | -3.004861 | I(0) |
| LDG | 0 | 1 | -3.981226 | -3.981226 | 3.004861 | I(0) |
| LVAT | 1 | 1 | -9.546841 | -14.48159 | -3.012363 | I(1) |

Credit: Researcher's measurements

The reliable value added tax variable is from level one and the reliable current and construction governments' size is from level zero. Thus, regarding that the reliable variables are not at the same level and due to small sampling volume, the present research used ARDL method.

*5.2. Proving long-term relation*

In order to verify that this is not a pseudo long-term relation, a model by Pesaran et al (1996a) is used, which tests the long-term relation between understudied variables using F statistics for levels' significance test with variables' lag in the form of corrected error (Teshkini, 2014; 134). Therefore, the hypothesis under test is the lack of long-relation hypothesis as hypothesis 8.

$$H_0 = \delta_1 = ... = \delta_n = 0 \tag{8}$$

F statistics, here, is used to study whether all coefficients equal zero (meaning that no long-term relation exists). The number of regressions is one; further, the above mentioned model includes intercept and time trend. On the other side, all three models contain I (0) and I (1) variables. Thus, both upper and lower critical value determined as the basis. Upper and lower limits were 7.423 and 6.603 at 95%, respectively. F statistic value for significance test of all

coefficients of the second model: "studying the effect of value added tax on construction expenditures to GDP ratio" was 9.5244, which is larger than upper limit. Thus, the null hypothesis of inexistence of long-term relation rejected. Upper and lower limits at 90% were 6.335 and 5.649, respectively. F-statistic value of significance testing of first model coefficients: "studying the effect of value added tax on current expenditures to GDP ratio" is 7.3113, which is larger than upper limit; thus, null hypothesis of lack of long-term relation is rejected at 90%.

### *5.3. Results of dynamic estimation (short-term)*

Following long-term existence ensured, since no abnormal failure seen in data path, short-term estimation results of both models are illustrated in Tables 3 and 4 through Schwarz Bayesian (SBC) lags determined by system.

Table 3.Results of estimating first model by ARDL method

| Variable | Coefficient | t-statistic | Probability | Result (95%) | |
|---|---|---|---|---|---|
| DLVAT | 0.31992 | 2.4530 | 0.025 | Significant | $R^2$=0.39825 |
| C | 2.7977 | 33.1101 | 0.000 | Significant | D.W=2.0164 |
| T | -0.016593 | -2.7834 | 0.012 | significant | F=5.9564 (0.01) |

Credit: researcher's measurement

Table 4.Results of estimating second model by ARDL method

| Variable | Coefficient | t-statistic | Probability | Result (95%) | |
|---|---|---|---|---|---|
| DLVAT | 2.1506 | 2.2463 | 0.037 | Significant | $R^2$=0.47833 |
| C | 2.5318 | 4.0817 | 0.001 | Significant | D.W=2.0745 |
| T | -0.16174 | -3.6961 | 0.002 | significant | F=8.2524 (0.003) |

Credit: researcher's measurement

### *5.4. Results of long-term estimation*

Following the test conducted and long-term relation ensured, long-term coefficients of the two models estimated. The results of long-term relation with Schwarz Bayesian (SBC) lags determined by system are represented in Tables 5 and 6.

Table 5. Results of long-term relation for dependent variable of current expenditure to GDP ratio

| Variable | Coefficient | T statistic | Probability level | Result (95%) |
|---|---|---|---|---|
| DLVAT | 0.31992 | 2.4530 | 0.025 | Significant |
| C | 2.7977 | 33.1101 | 0.000 | Significant |
| T | -0.016593 | -2.7834 | 0.012 | Significant |

Credit: researcher's measurement

According to the results, the long-term relation between value added tax and government size is as equation 9.

$$LCG_t=2.7977-0.016593T+0.31992DLVAT_t \quad (9)$$

All coefficients are significant. Value added tax coefficient is 0.32 indicating that value added tax positively and significantly influences the ratio of current expenditure to GDP. In other word, if value added tax increased by one unit, the ratio of current expenditure to GDP would increase up to 0.32 units.

Table 6. Results of long-term relation for dependent variable of construction expenditure to GDP ratio

| Variable | Coefficient | T statistic | Probability level | Result (95%) |
|---|---|---|---|---|
| DLVAT | 2.1506 | 2.2463 | 0.037 | Significant |
| C | 2.5318 | 4.0817 | 0.001 | Significant |
| T | -0.16174 | -3.6961 | 0.002 | Significant |

Credit: researcher's measurement

According to the results, the long-term relation between value added tax and construction government size is as equation 10.

$$LDG_t = 2.5318 - 0.16174T + 2.1506DLVAT_t \quad (10)$$

All coefficients are significant at 95%. Value added tax coefficient equals 2.2, which shows the positive, significant effect of value added tax on the ratio of construction expenditure to GDP. If value added tax increased by one unit, the ratio of construction expenditures to GDP may increase up to 2.2 units.

## 6. Error Correction model estimation

Cointegration of a series of economic variables provides statistical basic of using error correction models. The main reason of using such models is that it relates variables' short-term variations to long-term balance values. These models, indeed, are typical partial adjustment models in which inputting sustainable residue of a long-term relation makes effective forces in short-term as well as the speed of approaching to balanced long-term value measurable. In the case that the sign of error-correction coefficient is negative (it is anticipated), it indicates the speed of error correction and tendency to long-term balance. This coefficient shows that to what extent the dependent variable imbalance adjusted in each period approaching to long-term relation.

Coefficients were significant in both models with negative sign confirming variables' conintegration. ECM coefficient is significant in both models demonstrating model adjustment speed, which is high and adjustment toward balance implemented in small interval. It was -0.92649 and -1 for first and second models, respectively revealing that short-term and long-term coefficients are equal and the applied shocks to both models in short-term relatively adjusted in the very period.

### *6.1. Structural stability test results*

Coefficients' reliability was verified by CUSUM test. The test results demonstrated that the estimated coefficients of both models are constant (sustainable) within understudied period.(Figs 1,2,3,4)

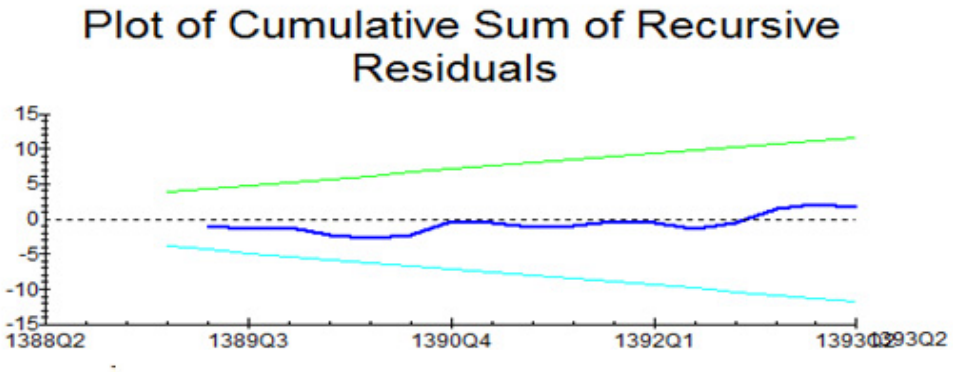


Fig 1.Structural stability test result by CUSUM (first model)

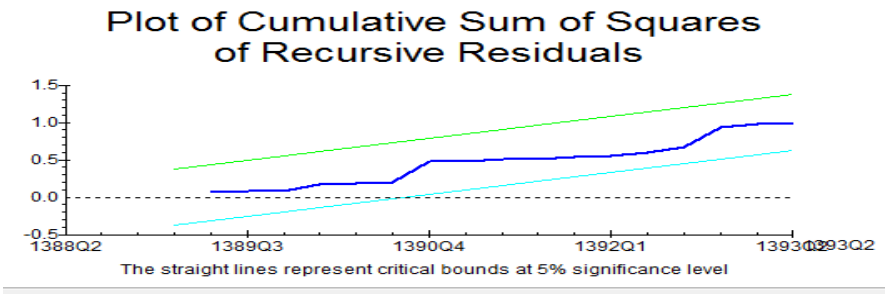


Fig 2. Structural stability test results by CUSUMQ)

Credit: Research results

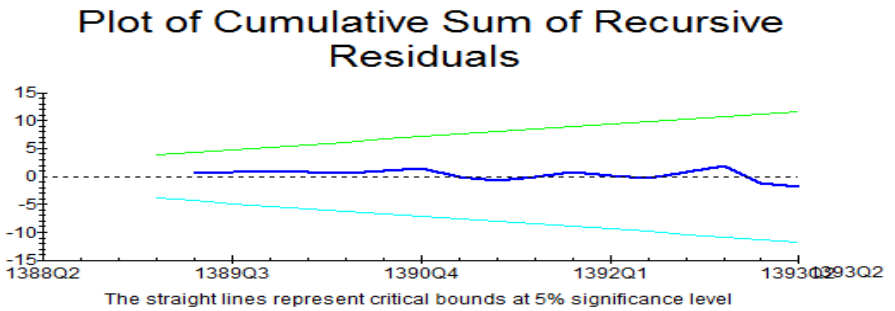


Fig 3. Structural stability test result by CUSUM (Second model)

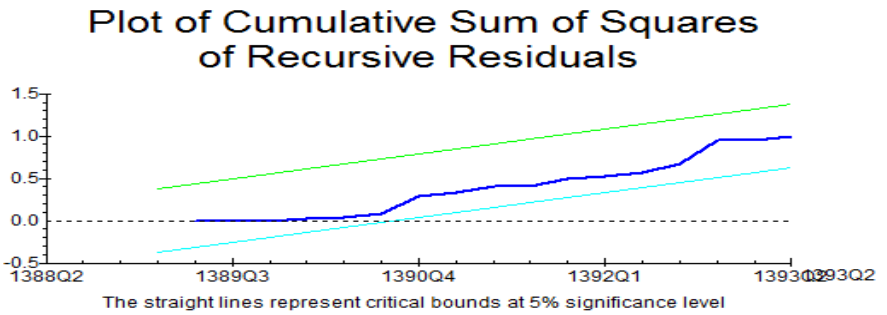


Fig 4.Structural stability test result by CUSUMQ

Credit: Research results

## 7. Conclusion and recommendations

This research used two models for studying the effect of value added tax on the size of current government and construction government. Both models estimated using ARDL method. Results showed variables' co-integration in long-term (there is a long-term relation between variables).

According to model estimation results, research hypotheses' test is as follows:

- Research first hypothesis maintained at 95% and value added tax increases the ratio of government current ratio to GDP. Research second hypothesis rejected.

- According to the model of interest estimation, value added tax coefficient is significant in both models. Long-term value added tax is positively related to the ratio of current expenditures to GDP (0.32); further, long-term value added tax is positively related to the ratio of construction expenditures to GDP (2.2) in which the coefficient is larger comparing the previous model. This may be due to imperfect privatization in Iran; further, private sector is much weaker than public sector in Iran and most major investments are by government contrary to developed countries.
- Value added tax coefficient in the first model "studying the effect of value added tax on the ratio of current expenditures to GDP" is less than the second model. According to low coefficients, it stated that value added tax is less spent on educational and health in spite of the goal of tax collection; in fact, it is less used for decreasing the poverty.
- Finally, it recommended that self-reporting tax system is highly activated so that the costs of value added tax collection reduced. In order to decrease poverty and improve welfare of low-income people, regarding the effect of value added tax on construction government size rather than current government size, it suggested that the collected tax is more spent on welfare expenses such as education and public health. Moreover, the government requires seriously following privatization and private sector investment process instead public sector investment so that value added tax is more optimally used for welfare objectives.

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